



ALZHEIMER'S

THE SCIENCE OF PREVENTION

David Perlmutter, MD
Full Length Interview Transcription

Perlmutter:	00:00:00	I'm Dr. David Perlmutter. I'm a neurologist. I became interested in preventive medicine as it relates to neurology because I was very frustrated in dealing with patients, in that I found we were only dealing with symptoms and really not addressing their problems. About that time I realized that there was, in fact, a lot of literature that correlated lifestyle choices to risk for things. For example, like Alzheimer's Disease. So, I made it my point to learn as much as I could about these risk factors and then to begin to employ them in my practice, talking to people about their diets, about the amount of exercise they engaged, what was the quality of their sleep, for example. I learned that, in fact, over time the literature that supported the impact of making important lifestyle changes was really expanding quite rapidly. I began outreach. I began writing books, I began writing articles and I began lecturing, not just to the public but also to medical professionals.
Perlmutter:	00:00:57	It really became quite obvious to me that people wanted this information. Again, for a disease like Alzheimer's where even today we don't have any meaningful treatment, understanding that our lifestyle choices are so important in determining who does, or who doesn't, get that diagnosis I think is fundamentally very, very important. I began to realize about 20 years ago that, in fact, lifestyle choices tend to segregate people into who does and who doesn't end up with a diagnosis of Alzheimer's Disease. I made it my business professionally to really get that message out. I thought it was very, very important back then, and certainly do now, to get the word out that people do have a say in terms of their brain's destiny.
Perlmutter:	00:01:43	You know, people take care of their skin. They take care of their bodies. They go to the gym so they have nice muscle tone. But, the reality is that the brain is actually very, very sensitive and very responsive to making good lifestyle choices. That was a thought we didn't really have several years ago but, in fact, the brain really does respond to the lifestyle choices that we make.
Perlmutter:	00:02:05	The field of Neurology is very challenging because the reality is that we don't have actual cures for so many of our challenging disorders. So, I began studying prevention as it relates to neurological diseases, like Alzheimer's and Parkinson's. It turns out that the world is absolutely desperate for this information,

and with good reason. These diseases are actually crippling our economy as it relates to medical expenditures. We have really good data that indicates that when people make the right lifestyle choices they can actually change the destiny of their brains. As we look at the common diseases that plague mankind, well there's diabetes, there are coronary artery disease issues, arthritis, et cetera. But nothing really compares to having a brain that becomes dysfunctional. The brain defines who you are. It allows you to participate in life. It allows you to care for yourself. So, really maintaining brain function is number one on the list.

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| Perlmutter: | 00:03:03 | I wish it were as simple as saying that Alzheimer's is caused by one thing, but the reality is it is not. It is absolutely what we call multifactorial. That means that multiple things conspire to ultimately manifest as a brain that degenerates with time. The good news is that the major players seem to be, for example, insulin resistance, and that has to do with our diet. A diet that's higher in sugar and refined carbohydrates challenges the hormone called insulin, and that ultimately leads to issues with the brain in terms of its energetics. That's a big player as it relates to Alzheimer's and, again, the good news is we can do an awful lot to keep that from happening. |
| Perlmutter: | 00:03:45 | It's been noted for many decades that when you look postmortem at the brain of an Alzheimer's patient often times there is accumulation of a specific protein called amyloid. Interestingly, that kind of motivated pharmaceutical companies to try to develop medications that might rid the brain of this protein, thinking that perhaps amyloid was the cause of Alzheimer's Disease. As it turned out, that connection wasn't really valid. Amyloid protein, although it often does accumulate in the Alzheimer's brain, is not the cause of Alzheimer's Disease. In fact, all of the medications that have been developed thus far to help rid the brain of amyloid have actually made people worse. What we understand now about amyloid is it might well be a response to, for example, infection. As such, ridding the brain of amyloid might well make things worse. |
| Perlmutter: | 00:04:38 | Perhaps one of the most important mechanisms that underlies Alzheimer's Disease is a process called inflammation. Most people know what inflammation is all about. For example when |

you get bitten by a bug your skin becomes inflamed. Well it turns out that this process underlies all of our chronic degenerative conditions, things like coronary artery disease, diabetes, cancer and even Alzheimer's and Parkinson's, for example. So, inflammation is a process that goes on in the brain and really speeds things along in terms of brain degeneration that ultimately manifest in what we call Alzheimer's Disease. So, this actually becomes important information, because then we can connect those lifestyle choices that help reduce inflammation to help us prevent the disease in the first place.

Perlmutter: 00:05:25 Years ago when I started out we began using MRI scans, and we noted that in the back parts of the brain there was atrophy or a loss of tissue that kind of defined Alzheimer's Disease, or at least supported the diagnosis. More recently we've been seeing that PET scans have been used that actually show that there are energetic changes that characterize the Alzheimer's brain. We are able to see that in the temporal areas and the parietal areas that the brain is less able to utilize glucose as a source of fuel and this lights up, actually very significantly in terms of what we are able to see on these sophisticated brain scans. One area that seems to be specifically targeted by Alzheimer's is called the hippocampus. It's a Latin word that actually means seahorse because that's how it's shaped. The hippocampus has been called our memory center, although it certainly does a lot of other things, as well. As mentioned, this is an early target for Alzheimer's Disease. What we see is a strong correlation between shrinkage in size of the hippocampus and the clinical deficits, for example, in memory that are so characteristic.

Perlmutter: 00:06:35 I think it's very, very important to recognize that the earliest changes that are occurring in the brain that set the stage for Alzheimer's may occur 20 or 30 years ahead of the clinical manifestation where people begin to notice, for example, changes in their memory. Why this is important is because we really need to get the message out that making lifestyle changes early on, in your 20s and 30s, is actually extremely important because the truth of the matter is once the symptoms begin to take place there is actually very little that can be done.

Perlmutter: 00:07:10 There is a very strong relationship between Alzheimer's Disease and diet. This modern Western diet that is now spreading

globally is a diet that favors higher consumption of sugar, higher consumption of refined carbohydrates, and it's really quite deficient in healthy fats and dietary fiber. This sets the stage for inflammation and, as such, we would then expect higher rates of Alzheimer's globally, and that is exactly what we are seeing. This has become a global epidemic. There are now 40 million people worldwide diagnosed with Alzheimer's Disease. Again, that's a disease for which there is no treatment. When we connect diet to Alzheimer's Disease it certainly lets us understand why it's so dramatically increasing in its worldwide prevalence, but it also gives us a powerful leg up in terms of what we can do moving forward to get the message out, again globally, that changing our lifestyles, changing the foods that we eat, might well impact this epidemic.

Perlmutter: 00:08:14 So, for people watching this series right now and thinking, "Well, this doesn't really apply to me. It really is more geared for Mom and Dad," the reality is, again, that the changes that begin, that set the stage for Alzheimer's happen in our 20s and 30s. Things like having a large belly and obesity in our 20s and 30s are associated with an up to tripling of the risk for Alzheimer's Disease down the line. One study appearing in the journal *Neurology* indicated that if you measure markers of inflammation in people in their 30s and 40s that translates to a significant increased risk for a shrinkage of the brain and memory decline some 20-30 years later. So, the changes that we make in our lifestyle choices now in our 30s and 40s, not that I'm that age, are really actually very, very valuable in helping to prevent this disease in the first place. Again, a disease for which there is no treatment once it has begun.

Perlmutter: 00:09:16 Research indicates that markers of inflammation, having a higher A1c, or average blood sugar, are strong predictors of cognitive decline. What does that mean to us in terms of the things we should be doing right now? It means we need to do everything we can to reduce inflammation. That means pay attention to the foods that we are eating. Pay attention to the amount of sleep that we get, the amount of exercise we get. Manage stress and be cognizant of our environmental exposures that might lead to inflammation, as well. As it relates to higher blood sugar and higher average blood sugar, or A1c, well that certainly centers on our dietary choices quite

importantly, meaning that we want to focus on a diet that's lower in sugar and lower in refined carbohydrates and welcome good fat back to the table.

- Perlmutter: 00:10:06 It's important to recognize that there are some well-defined risk factors for Alzheimer's Disease. They include having a higher waist to hip ratio, basically a bigger belly, having higher blood sugar and a higher average blood sugar or A1c. As a matter of fact, there was a very powerful study appearing in the New England Journal of Medicine way back in 2013 that demonstrated that even subtle elevations of blood sugar like 105 and 110, where your doctor is going to say, "Yeah, that's okay. It's in the normal range," not good enough for us. Those levels of blood sugar translates to an increased risk of dementia. Other risk factors for the development of Alzheimer's Disease include sleep disorders, not getting enough restorative sleep and even exercise is related. Being sedentary, what we call sedentarity, is also associated with increased risk for a disease for which we have no meaningful treatment.
- Perlmutter: 00:11:02 I might add that a recent study appearing in the Journal of the American Medical Association demonstrated that people taking what are called proton-pump inhibiting drugs, acid-blocking drugs if you will, may have as much as a 40% increased risk for developing Alzheimer's Disease. In addition, artificial sweetener consumption has also been associated with a pretty substantial increased risk for Alzheimer's.
- Perlmutter: 00:11:25 So, these are factors that do relate to increased risk, and it's really our mission as physicians, or doctors, the word actually means teacher, to get this information out to the public so that people are then empowered to make better decisions. My outreach has been to the public as a professional, as a neurologist. But, truth be known, I also experienced Alzheimer's affects personally with the death of my father, a brilliant brain surgeon, from this disease. I had wished while he was still alive that I had had a medication that was effective to treat this disease. Neither then, nor now, is there any effective treatment for Alzheimer's Disease. I'm very hopeful that our medical science and pharmacology can develop a treatment for Alzheimer's, but at this time a medical treatment for Alzheimer's, a pharmaceutical treatment doesn't exist.

- Perlmutter: 00:12:15 I have to admit that mainstream medicine doesn't really pay much attention to the notion of preventive medicine. We talk about our healthcare plans and healthcare really doesn't have to do with health, it has to do with illness. You have insurance to take care of you when you're sick but very little is emphasized as it relates to preventing disease in the first place. John Kennedy said that, "The time to fix the roof is when the sun is shining." Really, as we talk about Alzheimer's Disease that's very important, because preventive strategies are really very important.
- Perlmutter: 00:12:48 One of the most important differences between the brain that's healthy and the Alzheimer's brain has to do with the energetics of brain function, that is the Alzheimer's brain is compromised in terms of its ability to use glucose as a fuel source and that begins when people develop what is called insulin resistance. In other words, insulin, which is required to allow glucose to power the brain, is less effective. That's brought on by a diet high in sugar and refined carbohydrates. It would really be quite powerful if there was a meaningful drug for Alzheimer's. It turns out that's just not the case despite all of the research. When you recognize that your risk for Alzheimer's is 50/50, the flip of a coin if you live to be age 85 years, this becomes relevant for everyone. Many people have increased risk by virtue of their genetics, their family history, being a type 2 diabetic, the medications they may have taken, and even their body weight.
- Perlmutter: 00:13:49 As such, everyone needs to pay attention to this very important information about prevention, because it's very real. It's steeped in our most well-respected scientific journals, and it's something that we can all implement in our day-to-day lives. The purpose of this series is absolutely your empowerment. It's giving you the information so you can make powerful changes that relate to your brain's destiny. In a very real sense you can change the destiny of your brain by making important lifestyle decisions right now. We've heard a lot lately, especially in this day and age where people are understanding their genome about a so-called Alzheimer's gene. Well, it turns out that there are more than 20 genes that are associated with increased risk for this disease. By far and away the most common discussion centers around carrying what is called the APOE4 allele. If you

carry one copy of APOE4 your risk for Alzheimer's may be increased up to five-fold. If you carry two copies of the APOE4 allele some research indicates that your risk for developing Alzheimer's may be increased by as much 12-fold.

- Perlmutter: 00:14:58 While it's important to understand APOE4 and the fact that it's associated with increased risk for Alzheimer's, it is not a determinant. That means carrying the APOE4 allele doesn't mean that you will necessarily develop Alzheimer's Disease. That is very important information, because it means that if you adopt various lifestyle changes you can offset the risk that might be imparted by this gene. At the same time, if you don't carry the APOE4 allele, nonetheless, you can still develop Alzheimer's Disease. This means that these lifestyle changes are really relevant for everyone without any regard to their genetic predisposition.
- Perlmutter: 00:15:40 When I was in medical school we were told that our DNA lived in a glass case and basically determined everything about us. The notion that our genes would change in their expression over time was really nothing that was considered. But now we've learned that not only do our genes change in their expression over time but, more importantly, our lifestyle choices play a big role in determining which gene is activated or suppressed one moment to the next. That's important information because we now understand that more than 90% of the genes that have a role to play in health and longevity are actually fundamentally influenced by our lifestyle choices. That's really very empowering, and it means that to a significant degree we are controlling our own genetic expression. We are altering the expression of our life code.
- Perlmutter: 00:16:36 Back when I was in medical school we were told that we had a given number of brain cells and, for example, every time we drank a beer we would lose 40,000 brain cells or whatever the number was. That said, it's only been quite recently that we've understood that, in fact, the human brain repopulates itself with new highly-functioning brain cells throughout our lifetimes. We call this growth of new brain cells neurogenesis. What is really exciting about neurogenesis, again the growth of new brain cells in the human brain, is that to a very significant degree we can influence that activity. We can absolutely change

the number of brain cells that we possess based upon the influence of our lifestyle choices. One of the most influential lifestyle choices we can make as it relates to growing new brain cells is engaging in aerobic exercise. When we recognize that those who exercise have a lower risk of Alzheimer's, and the fact that exercise increases the growth of new brain cells, that connection really is pretty easy to understand.

- Perlmutter: 00:17:44 Another important revelation, if you will, that we didn't understand back in medical school was that our brains are actively forming new connections throughout our lifetimes. We did understand that part of the story but what we didn't know is that our lifestyle choices can profoundly influence the rate at which our brain cells connect to each other. Things like exercise and certain foods that we consume actually increase this action of neuroplasticity, which turns out to be pretty fundamental in terms of learning.
- Perlmutter: 00:18:16 So, what's really front and center these days in terms of research that relates lifestyle choices and blood evaluations to the risk of Alzheimer's is blood sugar. Again, this isn't necessarily new but it's been amplified in recent years. Blood sugar, even when it's mildly elevated, well before a person's been diagnosed with diabetes, is a powerful risk marker for the development of Alzheimer's Disease. This was published, actually, several years ago in the New England Journal of Medicine. What is so important about this understanding of the damaging effect of elevated blood sugar in terms of the brain is that it is something we control. Our diet controls our blood sugar, therefore, our diets play a huge role in determining the destiny of our brains.
- Perlmutter: 00:19:07 There are, actually, two important mechanisms whereby even mild elevation of the blood sugar is related to increasing risk for Alzheimer's Disease. So we have to ask ourselves, then, how does this elevation of blood sugar ultimately play out in terms of being damaging to the brain? There are two important mechanisms that we need to consider. First, when blood sugar is elevated it ultimately sets the stage for what we call insulin resistance. Insulin, in terms of its functionality, is very important for brain health and function. Insulin is important for the energetics of the brain. It's important for getting blood sugar into the brain so it can power brain cells. In addition, insulin is

what we call a tropic hormone. It's important for the health and vitality of brain cells. When we compromise the function of insulin by having persistent elevation of the blood sugar that's really bad for the brain.

Perlmutter:	00:20:02	Another important mechanism whereby elevation of blood sugar damages the brain is through amplification of inflammation. Blood sugar elevation, even when it's mild actually changes the shape of our proteins. We call this action glycation. One very important protein that is modified by sugar, or glycated, is hemoglobin. In fact, many people are familiar with this blood test, the modification of hemoglobin by being bound to sugar. It's called A1c. We see commercials on television talking about how people want to lower their A1c when they have type 2 diabetes by taking this or that medication. But let me assure you that the A1c is far more important than simply representing a marker of average blood sugar. When A1c is elevated it's not just the hemoglobin that's glycated but really many proteins throughout the body have been bound to sugar, and that's really very, very important because that process, the binding of blood sugar to protein, dramatically increases inflammation, the fundamental mechanism in Alzheimer's Disease that relates to damaging delicate brain cells.
Perlmutter:	00:21:19	What is so empowering about understanding this mechanism is that we can absolutely change the dynamics by changing our diets, adopting a diet that's lower in sugar, lower in refined carbohydrates, has higher fiber and welcomes healthful fat back to the table goes a long way to reducing this glycation of proteins, lowering A1c, lowering fasting blood sugar and lowering fasting insulin. Ultimately that plays out very positively for us by reducing inflammation. Let me be clear. This has implications well beyond the brain. Inflammation is the cornerstone of type 2 diabetes, coronary artery disease and even cancer.
Perlmutter:	00:22:04	Elevation of blood sugar is toxic to the brain in general and, more specifically, to the hippocampus. Research has demonstrated that the A1c, or average blood sugar, when it's elevated correlates not only with dementia risk but also with overall shrinkage of the brain. In addition, elevation of blood

sugar sets the stage for insulin resistance and that is a powerful threat to the brain. Recent research indicates that insulin resistance is actually correlated with increased risk for the accumulation of beta amyloid within the brain. Without a doubt there is a correlation between increased beta amyloid in the brain and the development of Alzheimer's Disease. But, I want to be clear, that's not a perfect relationship. In fact, some people have lots of amyloid in their brain and don't develop Alzheimer's Disease, while others may have very little and, in fact, do develop the disease.

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| Perlmutter: | 00:22:58 | While pharmaceutical researchers are hard at it to develop drugs to lower the amyloid burden in the brain, in actuality since insulin resistance is related to higher risk of having amyloid in the brain just reducing blood sugar may actually reduce the risk of having amyloid in the brain in the first place. That means that lifestyle choices, like lowering your consumption of sugar, might well be associated with lowering the amyloid risk for your brain in the first place. |
| Perlmutter: | 00:23:27 | Intermittent fasting is one way to improve insulin sensitivity. To be clear, when I say insulin sensitivity that's the opposite of insulin resistance, so insulin sensitivity is what we want. We want ourselves to be very sensitive to this hormone insulin, because that allows them to absorb blood sugar and keep our blood sugars in the normal range. Intermittent fasting helps reset the cells' sensitivity to insulin, and that's actually very important. Overall a diet that's lower in sugar and refined carbohydrates also goes a long way to improving insulin sensitivity. |
| Perlmutter: | 00:24:05 | Another important dietary approach to increasing insulin sensitivity, in other words, reducing insulin resistance, is going on what is called a ketogenic diet. Now a ketogenic diet, which is actually very popular these days, the number one search term in terms of health issues on Google in 2018, is a diet that favors the consumption of higher levels of healthy fat while dramatically lowering the consumption of sugar and refined carbohydrates. |
| Perlmutter: | 00:24:35 | One issue that's really very important to talk about, as it relates to engaging a ketogenic diet, and that is you don't want to take |

all the carbohydrates off the table. Dietary fiber is by definition a carbohydrate and that's something that you don't want to eliminate when you're engaging a ketogenic diet. Why we need good levels of dietary fiber is to nurture our gut bacteria. Our gut bacteria play a very fundamental role in, for example, the set point of inflammation in our bodies. When we recognize how important inflammation is as a mechanism related to Alzheimer's risk then nurturing our gut microbiome by having healthy levels of dietary fiber becomes all the more important.

- Perlmutter: 00:25:21 I think it's a bit unfortunate that we have type 1 and type 2 diabetes, because they are actually very, very different diseases. Both of them are characterized by elevation of blood sugar but in type 1 diabetes we are talking about an autoimmune condition. As it relates to type 1 diabetes that's a situation where the pancreas is no longer able to make enough insulin. So, insulin levels become actually very low, and the treatment for type 1 diabetes is, in fact, to give insulin. Type 2 diabetes, as it relates to insulin is actually very different, and in many regards just the opposite of type 1 diabetes. In type 2 diabetes insulin levels climb. But what happens is the body's cells become less and less responsive to insulin. We call that insulin resistance.
- Perlmutter: 00:26:11 Type 2 diabetes is very much related to dietary choices. While some people maintain a pretty good diet and nonetheless develop type 2 diabetes, by and large type 2 diabetes is related to a diet that's higher in sugar and refined carbohydrates. Obesity, or even being overweight and having a higher waist to hip ratio are strongly associated with the development of type 2 diabetes. Let's be clear, that's a disease that significantly increases the risk for developing Alzheimer's. The standard treatment that's used in America, for example, to treat type 2 diabetes actually does a good job at lowering blood sugar, but it doesn't treat the underlying disease. If you stop taking your medication within a day or two your blood sugar is going to go up.
- Perlmutter: 00:27:02 On the other hand, adopting a diet that's very low in refined carbohydrates and sugar, and welcomes good fat back to the table to the point of actually getting into ketosis can actually treat and reverse type 2 diabetes. So, the important message

here is that if you have type 2 diabetes, the medications are not necessarily treating the disease, only treating the symptoms. However, a ketogenic diet might well allow type 2 diabetics to actually treat the disease itself and no longer require medication.

- Perlmutter: 00:27:35 As we talk about preventing Alzheimer's Disease I think it's really important to understand that type 2 diabetes, which is the harbinger for future Alzheimer's disease in many patients, can well be prevented by engaging a diet that favors the consumption of fat for calories, making sure that's healthful fat, not modified fat. Not the Omega-6s that are so common in vegetable oils, for example, that line the grocery store shelves. A diet that's lower in sugar, that's lower in refined carbohydrates, but higher in another form of carbohydrate that we call dietary fiber. Physical activity is also really important in a lifestyle program to reduce your risk for developing type 2 diabetes and even treating the disease once it has begun. Diabetes is a powerful risk factor for Alzheimer's Disease down the line. Let's be clear, Alzheimer's is a situation for which we currently have no meaningful treatment. So, preventing diabetes and treating it appropriately goes a long way to preventing Alzheimer's Disease.
- Perlmutter: 00:28:41 Another important point is to recognize that type 2 diabetes isn't just a powerful risk factor for Alzheimer's. It's also associated with increased risk for coronary artery disease, and even cancer itself. I think the message is really out there now about the importance of limiting our consumption of carbohydrates. But what's really relevant is to be quite specific about what that means. Not all carbs are bad. Some carbohydrates, like dietary fiber, are actually very important for us and we shouldn't eliminate those. Dietary fiber goes a long way to nurturing our gut bacteria, and we want to really keep our gut bacteria healthy. Why? Because healthy gut bacteria translates to a healthy person. It's not just all dietary fiber that nurtures the gut bacteria. It's a specific type of dietary fiber that we call prebiotic fiber. Some of the foods that are really rich in prebiotic fiber include jicama, or Mexican Yam, dandelion greens, garlic, onions, leeks.

- Perlmutter: 00:29:45 You can also get prebiotic fiber at the health food store. There are, in fact, supplements of prebiotic fiber, some of which are derived from acacia gum, and acacia gum comes from the acacia tree. The acacia tree is that tall, shady tree that you see in pictures of sub-Saharan African where giraffes are getting out of the noonday sun. What's really neat about acacia gum is that it's harvested in a way that's sustainable. It doesn't damage the tree. It provides income for those individuals who harvest this gum that ultimately becomes this nutritional supplement that, again, you can buy at the health food store to give you more prebiotic fiber.
- Perlmutter: 00:30:24 So these days people are talking about eating more fat. That is absolutely a statement that has to be qualified. Why? Because eating more fat doesn't mean eating all the fats that come your way. Some dangerous fats are actually out there that can be associated with worsening of your health. These include the proinflammatory, omega-6 fats, which are found in vegetable oils like sunflower oil, and safflower oil, soy oil, canola oil. These are the grocery store oils that line the grocery store shelves that are higher in a type of fat called omega-6. Omega-6, in contrast to the omega-3 oils, is actually very proinflammatory and, therefore, these are the types of oils that we want to avoid. Omega-3 fatty acids are found in marine oils, for example, that come from fish products and are available even as nutritional supplements. Other types of oils include oils from nuts and seeds that you might get simply by eating these foods.
- Perlmutter: 00:31:27 Avocados are a great source of good dietary fat, as are olives and certainly olive oil. As a source of dietary fats olive oil is absolutely one of my favorites. Do you want to know why? Well, it turns out that studies indicate that consumption of olive oil is actually powerfully antiinflammatory. The Mediterranean diet itself has been associated with reduced risk for Alzheimer's Disease, and the PREDIMED study demonstrated that adding more fat to the diet, specifically in the form of olive oil, was associated with an even further reduction in Alzheimer's risk. I myself consume about a liter every week of extra-virgin organic olive oil.

Perlmutter:	00:32:08	<p>We've heard a lot about the dangers of trans fats, and that information is actually very important. As we see less and less trans fats in the food supply that's actually a very good thing. But trans fats are still out there, so it's really very important to read labels. So the question then becomes, "What does the anti-Alzheimer's plate look like?" This is a plate that, for the most part, is covered by colorful, above-ground vegetables. Vegetables are rich in so many nutrients that are good for the body and good for the brain. Vegetables are a powerful way to get high levels of prebiotic fiber into your diet, not just good for you but good for your gut bacteria. Now, if you choose to use animal products it's very important that you're selective in terms of what you're going to consume. If you choose to eat red meat, for example, it should absolutely be grass fed.</p>
Perlmutter:	00:33:01	<p>For those who tolerate dairy products and choose to consume them I recommend choosing organic products whenever you can find them. Full-fat milk is a better option in comparison to skim milk. Often times skim milk contains added sugar to make it taste better, because the fat has been removed. No doubt there's a lot of controversy as it relates to eggs. If you're going to consume eggs I recommend that you opt for pasture raised eggs. One animal-based food that we consume quite regularly is fish, and to be sure it's wild fish. Steer clear of farm-raised fish. So, a whole-food, plant-based approach is really a good plan as it relates to Alzheimer's prevention. But, it does come with some caveats.</p>
Perlmutter:	00:33:44	<p>Consuming entirely a vegetarian diet does present a couple of issues that you have to be cognizant of. Vegetarians, because they're only consuming plants, do run the risk of not having adequate amounts of vitamin D in their diets. In addition, magnesium and vitamin B12 are important considerations when you're a vegetarian, because you might need to supplement. So, two important things that vegetarians should consider in terms of their nutrition is that often times we see vegetarians having lower levels of vitamin D as well as vitamin B12. Look, a vitamin D blood test and a vitamin B12 blood test are quite simple. Any doctor can do them. That's how you know if you need to take additional supplementation. Another very important brain nutrient that you get from fish is DHA. But, if you're a vegetarian</p>

not consuming fish you might not be getting enough DHA in your diet. Fortunately, there are DHA supplements that are vegetarian. They are derived from marine algae. This might be a very good option for vegetarians.

Perlmutter: 00:34:46 Fasting is really something very new on the scene. It's only something that humans have been doing for about two million years. Fasting represents a stress to the body and, actually, low-level stress turns out to be pretty good for us because it activates some really important gene pathways. When low-level stress does something positive we call this hormesis. Fasting is a way of actually using hormesis to your advantage. Fasting actually amplifies gene expression that allows reduced inflammation, better reduction of free radicals by increasing antioxidants, and even increasing our ability to detoxify. Fasting also resets insulin sensitivity and as it relates to the brain that's really very important.

Perlmutter: 00:35:31 So, let's ask why somebody who is watching this series should care about eating healthy. Basically, the fundamental issue here is that dietary choices play a huge role in determining the destiny of your brain. Diet sets the stage for either increased inflammation or not. When we get our arms around the fact that inflammation is the central mechanism related to Alzheimer's Disease that makes diet very, very important in terms of choosing your brain's destiny.

Perlmutter: 00:36:01 Another type of medication that I think is very important to talk about are the statin drugs commonly used to lower cholesterol. Now I can't say that I'm aware of any data that specifically relates statin drugs to risk for Alzheimer's. There is certainly the risk of cognitive change that can occur when people take these drugs. But what really is important is to understand the data that relates taking statin drugs to risk for the development of type 2 diabetes. According to a study published in the journal Diabetologia men taking statin drugs may have as much as a 46% increased risk for developing type 2 diabetes. Even more compelling is a study published in the Journal of the American Medical Association demonstrating that women taking statin drugs may have as much as a 71% increased risk, again, for the development of type 2 diabetes. When we recognize the significant increased risk for the development of type 2 diabetes

in statin users, and the relationship of type 2 diabetes to Alzheimer's risk, this makes the potential connection between statin use and risk for Alzheimer's Disease quite real.

- Perlmutter: 00:37:09 Researchers around the globe are now looking at the so-called gut-brain connection and, specifically, the relationship of our gut bacteria to brain health and functionality. More recently we've been seeing research publications that actually connect changes in the gut bacteria to Alzheimer's Disease risk. It turns out that the level of inflammation in the human body is very much regulated by the health and diversity of the bacterial species that live within us. Bacteria make it their job to maintain the lining of the gut. When there are deficiencies in the gut lining then there is what we call leakiness or leaky gut whereby certain components within the gut then can leak across the gut lining and get into the systemic circulation. This is a powerful mechanism as it relates to the development of inflammation. This is the inflammation that is so damaging to the brain and underlies Alzheimer's Disease.
- Perlmutter: 00:38:06 So, we really have to do everything we possibly can to keep the gut bacteria healthy and happy. We want diversity and we want functionality. Diversity and functionality are brought about primarily by our food choices and limiting our gut bacteria's exposure to things that are actually toxic. Without question, the most important influence we have over the health and diversity and functionality of our gut bacteria are the foods that we choose to eat. Our gut bacteria thrive in an environment that's rich in prebiotic fiber, that has high levels of good fat, and that restricts simple sugars as well as refined carbohydrates.
- Perlmutter: 00:38:46 One food additive that is particularly threatening to gut bacteria is the use of artificial sweeteners. It really is quite interesting that so many people think, Well, they get the message with respect to the dangers of sugar then they opt for artificial sweeteners and perhaps nothing could be worse for the health of their gut bacteria. In fact, a recent study published in the journal Stroke indicated that those people who regularly consume artificial sweeteners may have a three-fold increased risk for the development of Alzheimer's Disease. Think about that. Consuming diet drinks may dramatically increase your risk

of development of this disease for which we have no meaningful treatment.

- Perlmutter: 00:39:29 While diet is really the fundamental as it relates to the health of our gut bacteria, other factors play a role as well. Inadequate restorative sleep, not getting enough exercise, and being exposed to chronic stress all damage the gut bacteria. These are factors over which we have control. So, getting a good night's rest, engaging in aerobic exercise, recognizing where stress is coming from in your life and eliminating those factors all go a long way to improving the health of your microbiome. Another important consideration is to embrace the idea that so many medications are threatening to the health of the gut bacteria. Some of the commonly used medications include these proton-pump inhibiting acid-blocking drugs that are so common. Antibiotics, a powerful threat to the gut bacteria, as well, as are the commonly used nonsteroidal antiinflammatory drugs like ibuprofen.
- Perlmutter: 00:40:25 As we talk about antibiotics and the effects of taking them in terms of damaging our gut bacteria really important to recognize that antibiotics remain very, very commonly used in terms of raising farm animals that people then eat. New research makes it very clear that these antibiotics are then found in the meat and make their way to humans when we consume that product. So, eating conventionally raised farm animals is one way of increasing antibiotic consumption, and that can further damage the gut bacteria. You know, up to 70% of the antibiotics utilized in America actually aren't used by people taking antibiotics. They are used in farm animals that we then consume.
- Perlmutter: 00:41:08 You know, it's often been said that when a woman is pregnant she needs to be careful what she's eating because now she's eating for two. Well, everyone walking the planet needs to be careful what they are eating because they're eating for 10s or even 100 trillion. That's the number of bacteria that live within us who depend upon our food choices in terms of what they're going to consume. We've got to make the right choices in terms of what we eat, because our gut bacteria depend upon us making those good decisions. Gut bacteria need high levels of fiber, specifically prebiotic fiber, to keep us healthy. Nurture

your gut bacteria, it goes a long way to keeping you healthy. When gut bacteria get what they want, in other words, higher levels of prebiotic fiber, it reduces inflammation in your body, and this is really very important as we recognize that inflammation is the cornerstone mechanism with respect to Alzheimer's Disease.

- Perlmutter: 00:42:03 So, what do you need in your diet? You need a lot of colorful vegetables rich in fiber. You want to make sure that many of your vegetables are high in prebiotic fiber. That's the type of fiber that nurtures the gut bacteria. These are foods like Mexican yam, which really is not an above-ground vegetable but we think it's important nonetheless because it's so high in prebiotic fiber. Garlic, onions, leeks. One of my favorites is dandelion greens, chicory root. These are all foods that are high in prebiotic fiber that nurtures our gut bacteria. Let me be clear, prebiotic fiber and fiber in general are derived from carbohydrates. They are by definition carbohydrates, but this is an exception to the rule that we want to limit our carbohydrate consumption.
- Perlmutter: 00:42:52 So, a key idea in keeping you healthy is keeping your gut bacteria healthy. Your gut bacteria play an incredible role in so many parts of your physiology, from metabolism and regulating your blood sugar, to changes in your mood, to how your brain works in terms of day-to-day functionality and memory, as well as long-term risk for brain disease. Your gut bacteria are making chemicals that are important throughout your body to keep your body functioning well. Your gut bacteria also play a role in making B vitamins that are so important for your health. Gut bacteria control your immunity, and you want an immune system that's in the Goldilocks zone, not over active where we have risk for autoimmunity and certainly not underactive where we increase our risk for infection.
- Perlmutter: 00:43:40 Chronic stress increases the production of a chemical called cortisol and cortisol actually induces changes in the gut bacteria that set the stage for inflammation. That inflammation is damaging to the brain and is seen to be elevated as a risk factor related to risk for Alzheimer's Disease. So, this connects chronic stress through the gut bacterial changes brought on by cortisol to increase inflammation and increased risk for Alzheimer's

Disease. In addition, we know that cortisol itself, when it's chronically elevated by chronic stress, is particularly toxic to the brain's memory center called the hippocampus. When we experience chronic stress and, therefore, have chronic elevation of the hormone cortisol that is, specifically, damaging to the hippocampus, as was so elegantly described by Dr. Robert Sapolsky. Dr. Sapolsky, working with primates, was able to demonstrate that when a primate animal was exposed to chronic stress there was a dramatic drop out in terms of the number of cells that were functioning in the brain's memory center, the hippocampus.

Perlmutter: 00:44:48 More recently, human studies have absolutely supported this idea that chronic stress is definitely bad for the brain. Being exposed to nature is one very important way of reducing stress. Interestingly, a study that was just published demonstrated that those individuals who did spend time in nature, even if they were in an urban environment, showed lower levels of cortisol in their saliva, cortisol being a very important hormone as it relates to a marker of stress. As we recognize the powerful relationship between chronic stress and risk for Alzheimer's Disease that makes managing stress something very important for all of us. Stress reduction, reducing our exposure to stressful situations, and learning how to deal with stress are very important components to a program to help an individual reduce his or her risk for developing Alzheimer's Disease.

Perlmutter: 00:45:42 Epidemiologic studies have demonstrated for quite some time that individuals who exercise more have a reduced risk for developing Alzheimer's Disease. But I have to say, we never really understood why there was that connection until actually quite recently. What we've learned only quite recently is that exercise has a powerful epigenetic effect. That means it can change gene expression, in fact quite powerfully. One of the gene pathways that is powerfully amplified by exercise is the gene pathway that has to do with the production of a certain chemical called BDNF. BDNF stands for brain derived neurotrophic factor. As it turns out, as published in the Journal of the American Medical Association, higher levels of BDNF are associated with a significantly reduced risk for developing Alzheimer's Disease. So how handy is this information? We want

higher levels of BDNF, and now we see powerful research that shows that exercise can make that happen.

- Perlmutter: 00:46:44 High levels of BDNF brought on by exercise are associated with reduced risk for Alzheimer's Disease, and who wouldn't want that? In addition, BDNF is also associated with increased protection of brain cells with respect to being damaged by trauma. If that's not enough, BDNF also turns on the action of what we call neuroplasticity, and that is the ability of one brain cell to connect to the next, fundamental for the process of memory formation. To be sure, there are other things aside from exercise that also amplify BDNF production, things like taking a good DHA supplement or eating wild fish, using turmeric in your cooking, or taking a turmeric supplement. There's a new supplement on the block and that's called Whole Coffee Fruit Concentrate that's been demonstrated to significantly amplify BDNF as well.
- Perlmutter: 00:47:36 There are other aspects of exercise that are really good for the brain, aside from the fact that it amplifies BDNF production. Exercise is associated with increased blood flow and oxygenation of the brain. It helps reduce inflammation. Exercise actually improves insulin sensitivity and can help lower blood sugar. All of these factors really come together supporting the important role of exercise in terms of Alzheimer's prevention. Myself, I exercise a minimum 30 minutes every day, often times a lot more. Why do I do that? Well, I know what Alzheimer's looks like having dealt with Alzheimer's in my clinic for more than 30 years, and I also experienced what it's like when my father died of that disease.
- Perlmutter: 00:48:20 We're hearing a lot these days about the importance of our circadian rhythm. Circadian means circa around. Dia means day. So it means that our bodies really do function on a 24-hour clock. It's not just our bodies and the cells of our bodies. It turns out that even our microbes, even the gut bacteria, live and function on a circadian rhythm. So, we want to live as much as we can connected to what our circadian rhythm expects. In other words, we want to sleep at night and we want to eat in the daytime. We want to be active during the day and, obviously, not so active in the evening. Being closely adherent to our circadian rhythm has a lot of health benefits, including

reducing inflammation. So, when we are mindful with choosing our day-to-day activities and our lifestyle choices to be in conjunction with our circadian rhythm, that's really very important to remaining healthy and reducing inflammation.

- Perlmutter: 00:49:16 Scientists have only recently discovered what is called the glymphatic system. This is an extremely interesting pathway in the brain whereby the brain is able to rid itself of toxins. We know that during the course of our day-to-day lives our brains accumulate debris. It is during sleep, particularly during deep sleep, that our glymphatic system is activated actually allowing it to take out the garbage. This is very important, because accumulation of debris within the brain sets the stage for inflammation, and that's exactly what we don't want. So, this draws more attention to the importance of getting a good night's sleep and, particularly, having your brain engage in deep sleep.
- Perlmutter: 00:49:58 I think one of the biggest issues that compromises sleep these days is exposure to blue light. Blue light, which is certainly part of the color scale we get from sunlight during the day and that's actually a good thing. But what we know about blue light is it suppresses the pineal gland's ability to make melatonin. Melatonin is actually very important as it relates to sleep. Blue light comes from our electronic screens, like our tablets, our smart phones, even television. So, exposure to blue light later in the day and in the evening reduces our body's production of melatonin and can have a significant impact on our ability to get restorative sleep. So, there are, for example, amber-colored glasses that you can wear later in the day and into the evening that help to block blue light, allow your brain to make more melatonin, and that might well pave the way for a better night's sleep.
- Perlmutter: 00:50:46 Another biggie as it relates to sleep dysfunction is caffeine consumption. I love to drink coffee in the morning but I limit my consumption never having coffee after 2 p.m. The half-life of caffeine is actually about six hours. That means that consuming caffeine in the afternoon might well mean that you have caffeine on board in the evening and that can keep you from sleeping well. A couple other ideas to consider in terms of getting good restorative sleep, consider the importance of

exercise. We've talked about how important exercise is for the brain. Exercise helps us sleep better and that's good for the brain, as well. Also good idea to restrict eating for about three hours prior to going to bed. Having food just before you go to bed tends to divert your body's energies towards digestion, and we don't need that going on when we're trying to get to sleep. Good idea to keep the room cool to help you sleep. Think about setting the thermostat between 65 and 75 degrees.

Perlmutter: 00:51:44

Also, one really important thing to consider in terms of getting restorative sleep is regularity. That means going to bed at the same time during the week as you would on the weekends. So, you might wonder why restorative sleep is so important as it relates to your brain, and there are several reasons. First of all, sleep, especially deep sleep, is the time that we activate our glymphatic system, and that is the system in the brain that helps take out debris. We don't want accumulation of debris within the brain, because that sets the stage for inflammation. Dreaming is the time that we consolidate our memories, so we're able to benefit from our day's activities and what we've learned during the course of the day while we're dreaming. Poor quality sleep and not getting enough sleep is associated with increased inflammation. When we don't get enough restorative sleep it's actually associated with a higher risk of making poor dietary choices the next day. People who don't sleep enough tend to make dietary choices with foods that are higher in calories, and that means a higher likelihood of foods higher in sugar. Last, but certainly not least, we know that not getting enough sleep is associated with an increased risk for type 2 diabetes, and that's a powerful risk factor that relates to Alzheimer's Disease.

Perlmutter: 00:53:01

I want to talk about avoiding GMO foods, genetically modified foods, not because there's any specific research that indicates that there are significant risks associated with consuming the GMO foods themselves, but rather because the reason we have GMO foods in the first place is that it allows farmers to spray the crops, the foods that we then eat, with an herbicide called glyphosate. This is the active ingredient in what people may be more familiar with called Roundup, a weed killer. New research indicates that glyphosate clearly threatens human health. In fact, according to the World Health Organization glyphosate

should now be considered as a probable human carcinogen, meaning a cancer-causing agent. In addition, work by Dr. Stephanie Seneff at MIT clearly demonstrates that glyphosate poses a significant risk to the gut bacteria. Again, we can't have anything threaten our gut bacteria. We need healthy gut bacteria to help us reduce inflammation, the fundamental mechanism involved in Alzheimer's Disease. So, this then relates consuming GMO foods with risk for consuming glyphosate that threatens the gut bacteria, therefore, increasing risk for inflammation, inflammation being the cornerstone of Alzheimer's. That's why avoiding GMO foods is really important.

- Perlmutter: 00:54:21 I've often characterized artificial sweeteners as actually representing an environmental toxin. Well, they are certainly a toxin. We know that the real damage done by consuming artificial sweeteners is at the level of the gut bacteria. When we see research study after research study that recognizes this connection between consumption of artificial sweeteners and powerfully increased risk for things like type 2 diabetes and obesity it's really important to understand that the connection has to do with the changes in the gut bacteria. So, without a doubt people are getting the messaging that consuming sugar is a bad thing but that shouldn't provoke people to then consume higher levels of artificial sweeteners. That's about the worst thing you can do.
- Perlmutter: 00:55:09 Another important environmental toxin that we should absolutely consider is the new research that relates air pollution to Alzheimer's risk. For example, it's been demonstrated that living closer to a busy highway is associated with increased risk for developing Alzheimer's Disease. It turns out that the very small particles that we're exposed to when we're exposed to air pollution may incite inflammation in the human body and in the brain. Some of these particles increase inflammation when they become lodged in the lungs, and this inflammation can make its way quite readily into the brain. In addition, we know that the brain itself can be polluted, if you will, by these very small particles that make up air pollution.
- Perlmutter: 00:55:51 So, what can you do? What's the take-home message here as it relates to air pollution? Well, I think it's a good idea if you live in a big city to pay attention to the air pollution indices that are

published and might be on the radio, certainly on the internet every day. On those days when air pollution is at it's highest consider not going outside if that's an option. Or, if you do you may want to wear a mask.

- Perlmutter: 00:56:14 Ketones are a type of fat metabolite that have been characterized as being super fuel for the brain. We can develop ketones in the blood stream by going on a ketogenic diet and that's a diet that's really low in sugar and refined carbohydrates but has higher levels of good fat. We can also amplify ketones in the bloodstream by taking certain supplements like MCT oil or coconut oil. These are supplements that actually increase the body's production of these very healthy ketones that then can power the brain, reduce inflammation and can improve insulin sensitivity. In fact, one recent study in which MCT oil, medium-chain triglyceride oil, was used to increase ketones in the bloodstream in Alzheimer's patients, actually demonstrated improved cognitive function.
- Perlmutter: 00:57:03 Ideally, when you've made some important lifestyle changes you're going to sleep well. But there are some people who do require a little assistance in terms of getting to sleep and staying asleep. We've found that a lot of times simply adding magnesium to the regimen goes a long way to improving sleep. Some people may benefit from melatonin. Taking a small dosage of melatonin might well help people fall asleep and stay asleep and reap the benefits of a good night's rest. I want to make one point about melatonin and that is it shouldn't be the first choice. First choice would be changing lifestyle issues like we talked about. If you're going to use melatonin it would be good to consult a healthcare provider to figure out what dosage might be appropriate for you.
- Perlmutter: 00:57:44 Magnesium dosaging should be as tolerated, but also should reflect a blood test. What is the level of intracellular magnesium? That's a blood test that any healthcare provider can do. Vitamin E dosage is really an interesting topic these days. Typically we recommend around 2000 International Units, but this is something that should be calculated based upon your blood test when you determine how much you might really need. We like to target a blood level of somewhere between 60-70 ng/mL of vitamin D. DHA, again docosahexaenoic acid, an

omega-3 should be taken at least 1000 mg a day and sometimes up to 1200 or even 1400 mg daily.

- Perlmutter: 00:58:28 I think it's really valuable to take a good B complex vitamin each day. Now some people need a special form of B vitamins called methylated B vitamins. How would you know that? You would only know that if you did some form of genetic test, which is certainly quite common these days, like 23andMe. Some people, in fact about 25% of Americans, have what's called MTHFR. That means they need a special form of B vitamins called methylated B vitamins. I have MTHFR so I have to take this special form of B vitamins. They're available everywhere.
- Perlmutter: 00:59:02 Typical dosage of melatonin that can help people get to sleep is around 1-2 mg. I think, again, it's important to understand that everybody shouldn't be relying upon melatonin or other nutritional supplement to get to sleep. Step one is looking at the lifestyle issues that may be precluding your ability to fall asleep, things like blue light exposure, caffeine consumption later in the day, not getting enough exercise. These all can keep people from falling asleep. Those should be step one.
- Perlmutter: 00:59:31 With respect to turmeric, it's really quite difficult to determine a specific dosage. There are some terrific supplements out there but you might just want to begin using turmeric in your cooking. Whole Coffee Fruit Concentrate is an exciting supplement that's really new on the scene. It's exciting because it's been demonstrated to dramatically increase BDNF. Again, that's the chemical in the body that turns on the production of new brain cells. Most of the research has looked at about 100 mg of Whole Coffee Fruit Concentrate daily. A typical dosage of MCT oil, if you're going to choose to supplement with it, and I recommend that you do, it's about a tablespoon to two tablespoons daily. If you're going to increase your dosage up to two tablespoons a day start with one tablespoon a day for let's say a week and then increase.
- Perlmutter: 01:00:17 Probiotics are really important for keeping the gut healthy. First, I recommend that you look for a probiotic that has a lot of different types of bacteria in it, let's say 12-15 different types of bacteria. Second, you want to get a really powerful probiotic, one that has 30, 40, maybe even 50 billion organisms. The last

thing you want to think about in buying a probiotic is to make sure it has really good shelf stability, that the label tells you that it guarantees shelf life availability of these organisms. Prebiotics can generally come from your diet, but if you need a supplement with prebiotic fiber a good heaping tablespoon of prebiotic derived from acacia and baobab is a really good idea. A good tablespoon a day, it blends very nicely into a smoothie or even a glass of water.

Perlmutter:	01:01:07	<p>Interestingly, higher coffee consumption is associated with a pretty dramatic risk reduction for Alzheimer's Disease. The studies have taken it all the way up to five cups of coffee a day. I think that's a lot of coffee. I can tell you from personal experience that would be a lot of coffee for me. I think you're going to derive benefits even from two to three cups of coffee a day, directly related to improving your risk in terms of Alzheimer's Disease. We also know that consuming coffee is associated with higher ketone production, and that's an added benefit as it relates to the brain. But, let's be clear. We're talking about black coffee. We're not talking about these concoctions that are sold in various coffee stores with whipped cream and vanilla extract and who knows how much sugar. These are not good ideas as it relates to your brain protection program.</p>
Perlmutter:	01:02:00	<p>So, let's unpack for just a moment why coffee consumption is a good idea as it relates to your brain. Coffee directly inhibits what's called oxidative stress, or the damaging effects of free radicals and this happens in the brain as well, allowing us to protect our brain cells. Coffee enhances the production of what's called BDNF and that is the body chemical that increases the growth of new brain cells and augments this process of neuroplasticity whereby one neuron can connect to the next. Coffee consumption is also associated with increasing the production of ketones within the body and that's an added benefit for the brain. Finally, we know that coffee itself amplifies a certain gene pathway called the Nrf2 pathway. Now the Nrf2 pathway is not going to be on the quiz. Let me explain why that's important. Nrf2 is a master pathway as it relates to gene expression. When we activate the Nrf2 pathway by consuming coffee, consuming cruciferous vegetables, or using turmeric we increase our body's production of antioxidants, we decrease inflammation, and we enhance our detoxification</p>

pathway. These are really good things to do in a brain protection program.

- Perlmutter: 01:03:17 I've said this before. Alzheimer's Disease is a devastating situation and it's now globally an epidemic. I wish we had a treatment for this disease but we don't, and this is really very important in the context of the fact that by and large Alzheimer's is preventable. We can absolutely do a lot of things to help reduce our risk for this devastating situation. So many factors play into whether we do or don't get Alzheimer's Disease. Most important are our dietary choices. Choosing a diet that's higher in sugar opens the door to this devastating situation. These factors include being on the right type of diet, getting regular exercise, making sure we're experiencing restorative sleep, minimizing stress in our lives, and taking a few key supplements that are really important for brain health, functionality and disease resistance.
- Perlmutter: 01:04:13 Moving forward it may very well be that our great pharmaceutical companies develop a treatment for this disease, but that's not where we are right now. Alzheimer's doesn't begin generally in our 60s and 70s when we start to notice that our memory is failing. The issues that indicate the brain is beginning to fail begin 20, 30, perhaps even 40 years prior to the onset of what we call clinical symptoms, failing memory, poor decision making. Inflammation, changes in blood sugar, insulin resistance, these things all begin to affect the brain much earlier in our lives and, therefore, this message is really important for those of you in your 20s, 30s and 40s. I am so grateful to have this opportunity to share this information with you, and I really want to thank you for paying attention.